Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Stochastic methods for capturing dispersion in particle-laden flows** AARON LATTANZI, University of Michigan, VAHID TAVANASHAD, SHANKAR SUBRAMANIAM, Iowa State University, JESSE CAPECELATRO, University of Michigan — Owing to a balance between speed and resolution, Eulerian–Lagrangian (EL) methods have gained substantial traction for modeling strongly-coupled particle-laden flows where the solids dynamics are intimately linked to the carrier fluid flow. However, existing drag force closures developed for EL methods typically capture the mean fluid-particle force experienced by an assembly of particles. Therefore, the variance in drag force, arising from neighbor-induced fluid disturbances, is generally ignored, with implications on the accuracy in quantitatively predicting particle velocity variance and dispersion. Here we provide a detailed account of stochastic approaches that may be utilized in EL methods to account for neighbor-induced drag force fluctuations. The frameworks correspond to Langevin equations for the particle position (PL), particle velocity (VL), and fluctuating drag force (FL). Rigorous derivations of the particle velocity variance and dispersion resulting from each method are obtained. It is shown that the FL method allows for the most complex behavior, enabling control of both granular temperature and dispersion. The FL framework considered here acts as a foundation for improving EL methods by accounting for the statistics of the unresolved neighbor-induced flow.

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Date submitted: 28 Jul 2020

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